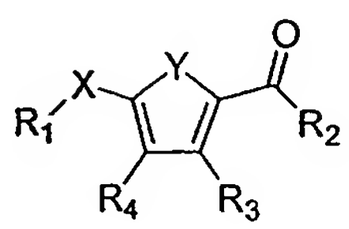
CLAIMS

1. A compound of the formula:



wherein,

R_1 is alkyl, aryl, or heterocyclyl;

R_2 is H, alkyl, aryl, heterocyclyl, OR_3, or $N(R_3)_2$;

R_3 is H, alkyl, aryl, or heterocyclyl;

R_4 is H, CN, halogen, CF_3, CO_2R_3, or $C(O)N(R_3)_2$;

X is S, SO_2, O, or NR_3; and

Y is S, O, or NR_3.

2. The compound of claim 1, wherein

R_1 is alkyl, aryl, or heterocyclyl;

R_2 is H, aryl, heterocyclyl, OR_3, or $N(R_3)_2$;

R_3 is aryl or heterocyclyl;

R_4 is H, CN, halogen, CF_3, or $C(O)N(R_3)_2$;

X is S, SO_2, or O; and

Y is S or O.

3. The compound of claim 1, wherein

R_1 is alkyl, aryl, or heterocyclyl;

R_2 is H, OR_3, or $N(R_3)_2$;

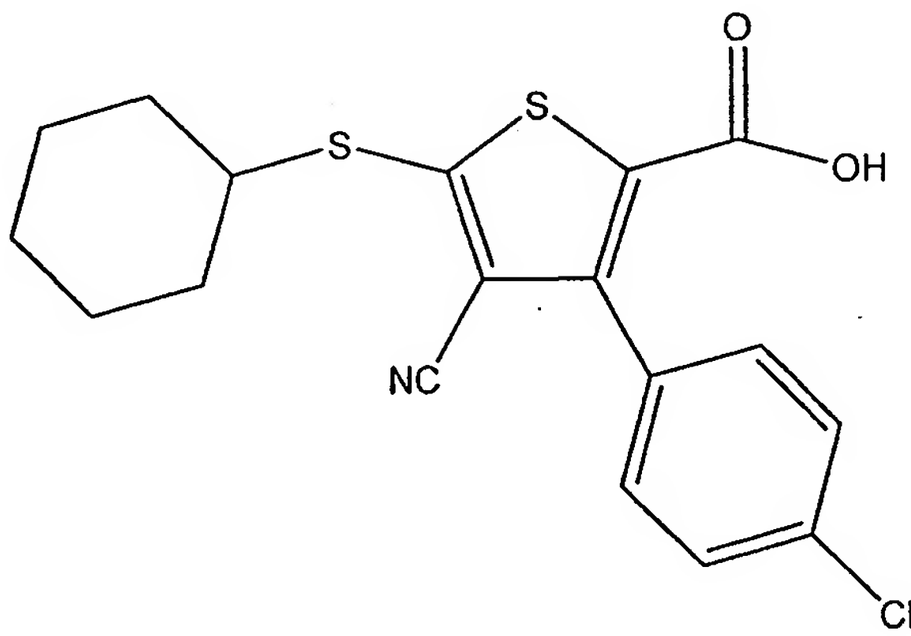
R_3 is aryl or heterocyclyl;

R_4 is H, CN, F, Cl, Br, or CF_3;

X is S; and

Y is S.

4. The compound of claim 1, wherein the compound is represented by the formula:



5. A pharmaceutical composition comprising an effective amount of a compound of claims 1, 2, 3, or 4, and a pharmaceutically acceptable carrier.

6. The pharmaceutical composition of claim 5, wherein the pharmaceutical composition is sterile.

7. The pharmaceutical composition of claim 5, wherein the pharmaceutically acceptable carrier includes a buffering agent, a chelating agent, a preservative or an isotonicity agent.

8. The pharmaceutical composition of claim 5, further comprising an anti-cancer agent.

9. The pharmaceutical composition of claim 8, wherein the anticancer agent is selected from the group consisting of

10. The pharmaceutical composition of claim 5, further comprising an anti-pathogenic agent.

11. The pharmaceutical composition of claim 10, wherein the anti-pathogenic agent is selected from the group consisting of

12. The pharmaceutical composition of claim 5, further comprising an antigen.

13. The pharmaceutical composition of claim 12, wherein the antigen is a cancer antigen.

14. The pharmaceutical composition of claim 12, wherein the antigen is a viral antigen, a bacterial antigen, a fungal antigen or a parasitic antigen.

15. The pharmaceutical composition of claim 5, further comprising an immunomodulatory agent.

16. The pharmaceutical agent of claim 15, wherein the immunomodulatory agent is an adjuvant.

17. The pharmaceutical agent of claim 15, wherein the immunomodulatory agent is a hematopoietic cell stimulator.

18. The pharmaceutical agent of claim 15, wherein the immunomodulatory agent is a cytokine or a growth factor.

19. The pharmaceutical agent of claim 15, wherein the immunomodulatory agent is an immunostimulatory oligonucleotide.

20. The pharmaceutical agent of any one of claims 5-15, wherein the compound is as in claim 1.

21. The pharmaceutical agent of any one of claims 5-15, wherein the compound is as in claim 2.

22. The pharmaceutical agent of any one of claims 5-15, wherein the compound is as in claim 3.

23. The pharmaceutical agent of any one of claims 5-15, wherein the compound is as in claim 4.

24. A method of modulating an immune response in a subject, comprising: administering to a subject in need of such immune modulation an amount of a compound of claims 1, 2, 3, or 4, effective to enhance the subjects immune response to an antigen.

25. The method of claim 24, wherein the compound is a compound as in claim 1.

26. The method of claims 24, wherein the compound is a compound as in claim 2.

27. The method of claim 24, wherein the compound is a compound as in claim 3.

28. The method of claim 24, wherein the compound is a compound as in claim 4.

29. A method for treating a subject having or at risk of having a cancer expressing a cancer antigen, comprising administering to the subject a therapeutically effective amount of a compound of claims 1, 2, 3, or 4.

30. The method of claim 29, wherein the cancer is selected from the group consisting of:

31. The method of claim 29, wherein the cancer expresses MHC class II.

32. The method of claim 29, wherein the cancer is a leukemia, a B-cell lymphoma, a renal carcinoma or a melanoma.

33. The method of claim 29, wherein the cancer is a refractory cancer.

34. The method of claim 29, wherein the subject has had or is scheduled to have surgery, radiation treatment or chemotherapy.

35. The method of claim 29, further comprising administering to the subject a cancer antigen.

36. The method of claim 35, wherein the cancer antigen is selected from the group consisting of

37. The method of claim 29, further comprising administering to the subject an immunomodulatory agent.

38. The method of claim 37, wherein the immunomodulatory agent is an adjuvant, a hematopoietic cell stimulator, a cytokine, a growth factor or an immunostimulatory oligonucleotide.

39. The method of claim 29, further comprising administering to the subject an anti-cancer agent.

40. The method of claim 39, wherein the anti-cancer agent is an antibody.

41. The method of any one of claims 29-40, wherein the compound is a compound as in claim 1.

42. The method of any one of claims 29-40, wherein the compound is a compound as in claim 2.

43. The method of any one of claims 29-40, wherein the compound is a compound as in claim 3.

44. The method of any one of claims 29-40, wherein the compound is a compound as in claim 4

45. A method for treating a subject having or at risk of having an infectious disease, comprising administering to the subject a therapeutically effective amount of a compound of claims 1, 2, 3, or 4.

46. The method of claim 45, wherein the subject has a chronic infection.

47. The method of claim 46, wherein the chronic infection is a chronic infection with HIV, Hepatitis C or tuberculosis.

48. The method of claim 45, wherein the subject has a bacterial infection.

49. The method of claim 45, wherein the subject has a bacterial infection and further comprising administering to the subject an anti-bacterial agent.

50. The method of claim 46, wherein the anti-bacterial agent is selected from the group consisting of:

51. The method of claim 45, wherein the subject has a viral infection.

52. The method of claim 45, wherein the subject has a viral infection and further comprising administering to the subject an anti-viral agent.

53. The method of claim 52, wherein the anti-viral agent is selected from the group consisting of

54. The method of claim 45, wherein the subject has a fungal infection.

55. The method of claim 45, wherein the subject has a fungal infection and further comprising administering to the subject an anti-fungal agent.

56. The method of claim 55, wherein the anti-fungal agent is selected from the group consisting of:

57. The method of claim 45, wherein the subject has a parasitic infection.

58. The method of claim 45, wherein the subject has a parasitic infection and further comprising administering to the subject an anti-parasitic agent.

59. The method of claim 58, wherein the anti-fungal agent is selected from the group consisting of:

60. The method of claim 45, further comprising administering to the subject an antigen.

61. The method of claim 60, wherein the antigen is a viral antigen, a bacterial antigen, a fungal antigen or a parasitic antigen.

62. The method of claim 45, further comprising administering to the subject an immunomodulatory agent.

63. The method of claim 62, wherein the immunomodulatory agent is an adjuvant, a hematopoietic cell stimulator, a cytokine, a growth factor or an immunostimulatory oligonucleotide.

64. The method of any one of claims 45-63, wherein the compound is a compound as in claim 1.

65. The method of any one of claims 45-63, wherein the compound is a compound as in claim 2.

66. The method of any one of claims 45-63, wherein the compound is a compound as in claim 3.

67. The method of any one of claims 45-63, wherein the compound is a compound as in claim 4.

68. A method of enhancing MHC Class II catalyzed peptide exchange comprising contacting a cell bearing a MHC Class II molucule with a compound of claims 1, 2, 3, or 4, in the presence of a peptide that binds MHC class II

69. The method of claim 68, wherein the MHC Class II molecule is HLA-DR2.

70. The method of claim 68, wherein exchange of MHC class II bound peptides is catalyzed by HLA-DM.

71. The method of claims 68, wherein the cell is a dendritic cell, a macrophage, a CD 40 activated B cell, or another professional antigen presenting cell.

72. The method of claims 68-71, wherein the peptide is a cancer antigen, a bacterial antigen, a viral antigen, a parasitic antigen or a fungal antigen.

73. The method of claims 68-71, wherein the compound is a compound as in claim 1.

74. The method of claims 68-71, wherein the compound is a compound as in claim 2.

75. The method of claims 68-71, wherein the compound is a compound as in claim 3.

76. The method of claims 68-71, wherein the compound is a compound as in claim 4.

77. A method for treating a subject comprising:

(a) contacting cells bearing a MHC Class II molecule with a compound of claims 1, 2, 3, or 4, in the presence of a peptide that binds MHC class II, and

(b) administering to a subject in need of such treatment the cells contacted according to (a).

78. The method of claim 78, wherein the cells are obtained from the subject and wherein the administration is the re-introduction of the obtained cells to the subject.

79. The method of claim 77, wherein the MHC Class II molecule is HLA-DR2.

80. The method of claim 77, wherein the MHC class II catalyzed peptide exchange is HLA-DM catalyzed peptide exchange.

81. The method of claims 77, wherein the cells are dendritic cells, macrophages, CD 40 activated B cells, or professional antigen presenting cells.

82. The method of claims 77, wherein the peptide is a cancer antigen, a bacterial antigen, a viral antigen, a parasitic antigen or a fungal antigen.

83. The method of claim 77, wherein the peptide is a cancer antigen, a bacterial antigen, a viral antigen, a parasitic antigen or a fungal antigen.

84. The method of claim 81, wherein the peptide is a cancer antigen, a bacterial antigen, a viral antigen, a parasitic antigen or a fungal antigen.

85. The method of claims 77-84, wherein the compound is a compound as in claim 1.

86. The method of claims 77-84, wherein the compound is a compound as in claim 2.

87. The method of claims 77-84, wherein the compound is a compound as in claim 3.

88. The method of claims 77-84, wherein the compound is a compound as in claim 4.

89. A method for preparing cells, comprising
administering to a subject a compound of claims 1, 2, 3, or 4, and
then obtaining immune system cells from the subject.

90. The method of claim 89, wherein the immune system cells obtained are T cells.

91. The method of claim 89, wherein the immune system cells are dendritic cells, macrophages, CD 40 activated B cells, or professional antigen presenting cells.

92. The method of claim 89, wherein the subject has an infectious disease.

93. The method of claim 89, wherein the subject has cancer.

94. The method of claim 92, further comprising administering to the subject an antigen that binds MHC Class II.

95. The method of claim 93, further comprising administering to the subject an antigen that binds MHC Class II.

96. The method of claims 89-95, wherein the compound is a compound as in claim 3.

97. The method of claims 89-95, wherein the compound is a compound as in claim 1.

98. The method of claims 89-95, wherein the compound is a compound as in claim 2.

99. The method of claims 89-95, wherein the compound is a compound as in claim 3.

100. The method of claims 89-95, wherein the compound is a compound as in claim 4.

101. An assay comprising:

providing isolated MHC class II molecule bound to CLIP;

contacting the isolated MHC class II molecule with a test compound;

contacting the isolated MHC class II molecule with HLA-DM and with a peptide that binds the isolated MHC class II molecule;

measuring the kinetics of binding of the peptide to the isolated MHC class II molecule; and

determining whether the test compound enhances binding of the peptide to the isolated MHC class II molecule as compared to a control.

102. The assay of claim 101, wherein the peptide is fluorescently labeled.

103. The assay of claim 101, wherein the kinetics of the binding of the peptide to the isolated MHC class II molecule is measured by fluorescence polarization.

104. The assay of claim 101, wherein the isolated MHC class II molecule is isolated HLA-DR2.

105. The assay of claim 102, wherein the isolated MHC class II molecule is isolated HLA-DR2.

106. The assay of claim 103, wherein the isolated MHC class II molecule is isolated HLA-DR2.

107. A kit comprising:
a first container containing a compound of claims 1, 2, 3, or 4 and
a second container containing an antigen.

108. The kit as claimed in clam 107, wherein the antigen is a cancer antigen.

109. The kit as claimed in claim 107, wherein the antigen is a viral antigen, a bacterial antigen, a fungal antigen or a parasitic antigen.

110. A kit comprising:
a first container containing isolated MHC class II bound to CLIP; and
a second container containing a peptide that binds the isolated MHC class II.

111. The kit of claim 110 further comprising a third container containing HLA-DM.

112. The kit as climed in claim 110, wherein the peptide is fluorescently labeled.

113. The kit as climed in claim 110, wherein the isolated MHC class II is isolated HLA-DR2.